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NONGAME BREEDING BIRD ACTIVITY IN AN INTENSIVELY CULTURED *POPULUS* PLANTATION

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ABSTRACT.—Discusses bird activity observed in a short-rotation intensive culture *Populus* plantation over 5 years, from site preparation into the sixth growing season.

KEY WORDS: Agro-forestry, succession, cottonwood, nesting birds, habitat.

Short-rotation intensive culture is a method of growing trees that is similar, at least initially, to farming traditional row crops. Plantations are usually established on old field sites. The impact that intensive culture *Populus* plantations may have on nongame birds has been previously discussed by Verch (1983). This study examines the change in breeding bird use of a 30-acre area in northern Wisconsin, from the time of establishment of an intensively cultured *Populus* plantation through the first 6 years of growth.

METHODS

The study area is located near Rhinelander, Wisconsin, on a tract of USDA Forest Service land known as the Harshaw Forestry Research Farm. This site is a former potato farm, and the soil is a sandy-loam underlain by sand at 1 foot. The study plantation is bounded by a pine plantation and mixed hardwood forest on the west, mixed hardwood forest on the north, abandoned fields (grass and weeds) on the east, and a county road and a small hardwood woodlot on the south (fig. 1).

I conducted bird surveys by walking access roads. All birds singing in the plantation were recorded by position on a map. These data were plotted by species on separate maps, and the number of territories encountered during the breeding season was determined from clusters of marks representing recorded birds. I conducted surveys in early- to mid-June each year from 1981 to 1984 and during the last week of June in 1985. Surveys were conducted during 2- to 3-day periods 4 to 5 times each year. Routes were walked at 5:00 a.m. and 3:30 p.m. The direction of survey walks was varied to minimize the effect of time. During other time periods, I walked through the plantation looking for nests.

RESULTS

Planting Year

As in traditional farming for row crops, site preparation for intensive culture plantations essentially eliminates all bird habitat for a period of time (Wood and Niles 1978). Plowing and disking eliminates plants and makes the site suitable for planting and cultural equipment. Cuttings are planted with mechanical planters and weed competition is reduced by use of herbicides. The result is a field of planted cuttings and exposed soil interspersed with occasional small clumps of grass and weeds. Killdeer, robins, Brewer's blackbirds, and song sparrows frequented fields of newly planted *Populus* and were observed in feeding activity each day the area was surveyed. Mourning doves, horned larks, vesper sparrows, Savannah sparrows, and Lapland longspur were seen once during the survey period. There was no evidence of first-year nesting activity on the plantation for any of the species observed.

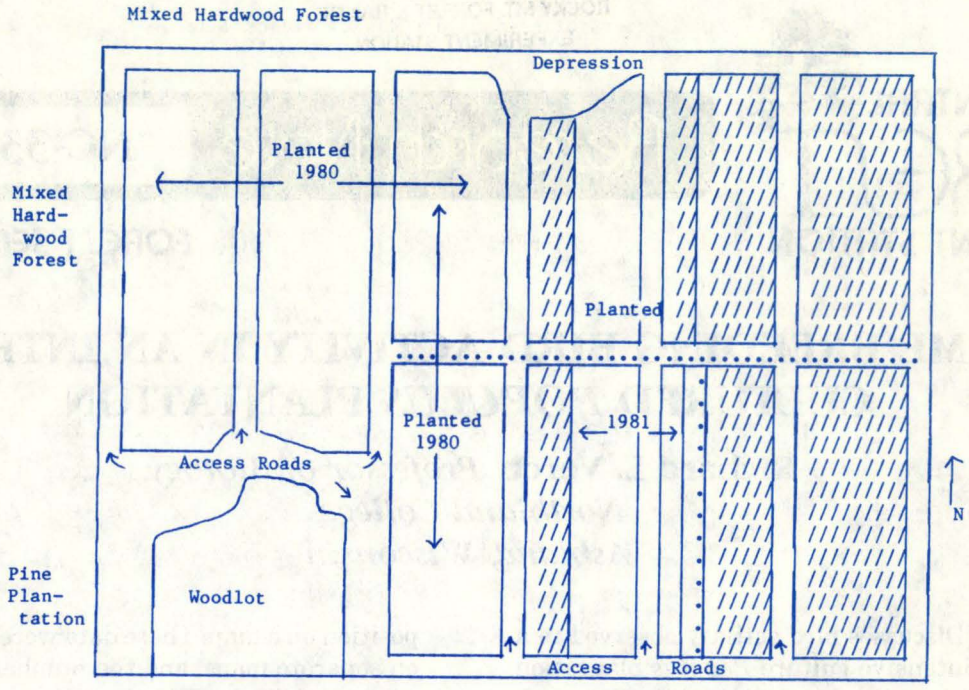

Figure 1.—*Diagram of Harshaw Farm* Populus *plantation. Shaded areas range from newly tilled to grass and weed covered. 1 inch = 110 feet, . . . = irrigation pips.*

Second Year

At the beginning of the second growing season, *Populus* in the study ranged from 1 to 2 m tall. Most growth during the first growing season was vertical growth. Branches were small and tended to parallel the main stem. Trees had abundant leaves, but the leaves were located near the stem and didn't provide much ground shade. As a result there was considerable ground cover, but it wasn't uniformly distributed. Some areas were heavily covered by grasses; other areas had scattered grasses, clovers, plantain, and mustards. Bird activity in these plantation areas was similar to that found during the planting year (table 1). Two nests of song sparrows and Brewer's blackbirds were located in clumps of weeds at the base of trees. Males of both species were observed using plantation trees as singing sites.

Third Year

Conditions on plantations during the third growing season were less uniform than the two previous years. Tree heights ranged from 1.8 to 4.3 m. Branching was heavy on trees in some areas; on these trees the leaf growth prevented most light from reaching the ground. This prevented growth of any significant ground cover. In other areas such as along roads and irrigation pipes and where trees had died or tree growth was inhibited, the ground was completely covered with herbaceous plants (grasses, mustards, and clovers). These conditions favored increased bird use, and 16 species were observed (table 1). A total of seven species appeared to use the third-year plantation for nesting although only a single robin nest was observed (table 2).

Fourth Year

At the beginning of the fourth growing season, trees ranged from 6.2 to 8.7 m tall and most were heavily branched. By the second week in June, the heavily leafed branches on the upper parts of the larger trees almost completely blocked sunlight from reaching lower branches and ground. This killed branches on lower portions of trees and limited ground cover in those areas. Road edges, areas along irrigation pipes, and areas where trees died or had poor growth were still covered with herbaceous plants, primarily quack grass. Bird activity on the 4-year-old plantation was heavy with 16 species observed (table 1). Seven species nested (table 2). Clay-colored sparrows, which nested in 3-year-old plantations, were no longer nesting in the plantation, but

Table 1.--Birds observed on plantations (1981-1985)

Species	Survey year 1981		1982		1983		1984		1985		Total years observed
	Planting year 1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	
Killdeer	+	+	0	+	0	0	0	0	0	0	2
Mourning dove	0	+	0	+	0	0	0	0	0	0	2
Yellow-billed cuckoo	0	0	0	0	0	0	+	0	0	0	1
Black-billed cuckoo	0	0	0	0	+	0	0	0	+	+	2
Eastern phoebe	0	0	+	0	+	0	+	0	0	0	3
Least flycatcher	0	0	0	0	0	0	0	0	+	0	1
Eastern kingbird	0	0	0	+	0	0	0	0	0	0	1
Horned lark	0	+	0	0	0	0	0	0	0	0	1
Blue jay	0	0	0	0	0	0	+	0	+	0	2
Black-capped chickadee	0	0	0	0	+	0	+	+	+	0	3
Veery	0	0	+	0	+	0	+	0	+	0	4
Robin	+	+	+	+	+	+	+	+	+	+	5
Catbird	0	0	+	0	0	0	0	0	+	0	2
Brown thrasher	0	0	+	0	+	0	+	0	0	0	3
Red-eyed vireo	0	0	0	0	+	0	+	+	+	+	3
Nashville warbler	0	0	0	0	+	0	0	0	+	0	2
Chestnut-sided warbler	0	0	+	0	+	0	+	+	+	+	3
Ovenbird	0	0	0	0	+	0	+	0	+	+	3
Common yellow throat	0	0	+	0	+	+	+	+	+	+	4
Rose-breasted grosbeak	0	0	0	0	+	0	+	0	+	0	3
Indigo bunting	0	0	+	0	+	+	+	+	0	+	4
Chipping sparrow	0	0	0	0	+	0	+	0	+	0	3
Clay-colored sparrow	0	0	+	0	0	+	0	+	0	0	3
Vesper sparrow	0	+	0	+	0	+	0	+	0	0	4
Savannah sparrow	0	+	0	+	0	+	0	+	0	0	4
Song sparrow	+	+	+	+	+	+	+	+	+	+	5
Brewer's blackbird	+	+	+	+	0	+	0	0	0	0	3
Brown-headed cowbird	+	0	+	0	0	0	0	0	0	0	2
Lapland longspur	0	+	0	+	0	0	0	0	0	0	2
American goldfinch	0	0	+	0	+	+	+	+	+	+	4
Totals	5	9	13	9	16	9	16	11	16	9	
Total different species in survey year	10		19		20		19		17		

chipping sparrows were found nesting. Nesting density decreased (table 2) for indigo buntings, common yellowthroat, and song sparrow but remained the same for the Eastern phoebe and increased for veerys and robins. Nests of robins, phoebes, and indigo buntings were located.

Fifth Year

Conditions on the fifth-year plantation were similar to those found the previous year. Most trees had grown vertically 1 to 1.5 m. Ground cover was completely lacking in areas where trees were dense and healthy but still heavy along road edges and where trees were dead or small. Sixteen species of birds were observed (table 1).

Indigo buntings and common yellowthroats ceased to breed in the 5-year-old trees planted in 1980, but single territorial males of each species were found in the 1981 planted trees. Two new breeding species (red-eyed vireo and ovenbird) were observed. Nests of veerys, robins, red-eyed vireos, and song sparrows were located (table 2).

Sixth Year

Vegetation on the plantation was similar to that found the previous year. Sixteen species of birds were found and six species showed evidence of breeding (tables 1, 2). The most common breeding birds again were red-eyed vireos and ovenbirds. The Eastern phoebe, which had been found breeding on 3-, 4-,

Table 2.--Breeding bird density on Populus plantations (territorial males/km^2)[1/]

Species	Survey year: 1981		1982		1983		1984		1985	
	Planting year: 1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
	Plantation Age: 2nd growing year	Planting year	3rd growing year	2nd growing year	4th growing year	3rd growing year	5th growing year	4th growing year	6th growing year	5th growing year
Eastern phoebe	--	--	(2)25	--	(2)25.0	--	(1)12.5	--	--	--
Veery	--	--	(1)12.5	--	(3)37.5	--	(1)12.5	--	(1)12.5	--
Robin	--	--	(1)12.5	--	(2)25.0	(1)12.5	(1)12.5	--	(1)12.5	(2)25.0
Red-eyed vireo	--	--	--	--	--	--	(3)37.5	--	(2)25.0	(1)12.5
Ovenbird	--	--	--	--	--	--	(2)25.0	--	(3)37.5	(1)12.5
Common yellowthroat	--	--	(5)62.5	--	(2)25.0	(2)25.0	--	(1)12.5	--	(1)12.5
Indigo bunting	--	--	(8)100.0	--	(3)37.5	--	--	(2)25.0	--	(1)12.5
Chipping sparrow	--	--	--	--	(1)12.5	--	--	--	(1)12.5	--
Clay-colored sparrow	--	--	(4)50.0	--	--	--	--	--	--	--
Song sparrow	1 nest	--	(6)75.0	--	(3)37.5	(2)25.0	(2)25.0	(1)12.5	(1)12.5	(1)12.5
Brewer's blackbird	1 nest	--	--	(4)50.0	--	(1)12.5	--	--	--	--

[1/] Numbers (3)12.5 = (3 territories in study area, 12.5 territories/km^2)

and 5-year-old plantations, was not observed. Nests of robins, red-eyed vireos, veerys, chipping sparrows, and song sparrows were found.

Areas Adjacent to the Study Area

No attempt was made to count birds in adjacent areas but lists of birds seen or heard were developed each year (table 3). During the first survey period in 1981, 23 woodland and 4 field species were detected. Over the study period, annual counts of woodland species ranged from 20 to 25, and field species ranged from 3 to 6.

DISCUSSION

Establishing intensive culture plantations on old fields or on previously wooded areas will have an impact on existing bird populations. Effects that should be considered when determining potential plantation sites were discussed by Verch (1983). Many birds require specific habitats. Populations in recently abandoned fields may be very different from bird populations found in older fields in varying successional stages. Species that will be affected by establishing plantations can only be determined by surveying potential sites before they are disturbed.

Bird use appears to be diminished for 2 years after a *Populus* plantation is planted. Nine species of birds (table 2) were observed using planting-year and second-growing year plantations during this study, but only killdeer, robins, Brewer's blackbirds, and song sparrows were observed regularly. Nests of song sparrows and Brewer's blackbirds were located, but most activity appeared to be feeding activity on the edges of plantations.

As trees grew larger and areas with ground cover became available, the number of habitats in the plantation also increased, and bird usage was greater in both numbers of species and densities (tables 1, 2). Areas that provided "edge effect" were important. Effects of monoculture on wildlife were closely related to size and shape of the plantation. Roads, irrigation pipes, and areas where trees died or were stunted provided heavy herbaceous cover that added variety in cover and feeding opportunities.

Successional stages provide different habitats and niches. Song sparrows were found nesting in all stages except newly established fields. This species prefers bushy cover and eats seeds of grasses and weeds in the summer. Favorable conditions for song sparrows existed during all the study periods. Other bird species appear to have found favorable conditions for a time, but as conditions changed their use of plantations decreased. Examples were indigo buntings and common yellowthroats. Both were found in relatively high densities on 3- and 4-year-old plantations but either decreased in or disappeared from 5- and 6-year-old plantations. Because these species prefer shrubby weed-grown fields, their presence reflects earlier successional stages.

Table 3.--Birds observed in woods and fields adjacent to plantation area (w=woods, f=fields)

Species	1981	1982	1983	1984	1985
Mourning dove	--	w	--	w	--
Black-billed cuckoo	w	w	--	w	w
Yellow-billed cuckoo	--	--	--	w	--
Downy woodpecker	w	--	w	--	--
Northern flicker	w	--	w	w	w
Eastern wood-peewee	--	w	--	w	w
Least flycatcher	--	w	w	w	w
Great crested flycatcher	w	w	w	w	w
Blue jay	w	w	w	w	w
American crow	w	w	w	w	w
American raven	--	--	--	--	w
Black-capped chickadee	w	w	w	w	w
Veery	w	w	w	w	w
American bluebird	--	--	--	--	f
American robin	w	w	w	w	w
Grey catbird	w	--	--	w	w
Brown thrasher	w	w	w	w	w
Warbling vireo	w	--	w	w	--
Red-eyed vireo	w	w	w	w	w
Chestnut-sided Warbler	w	w	w	w	w
Black & white warbler	w	w	--	w	--
Ovenbird	w	w	w	w	w
Yellow warbler	--	--	--	--	w
Nashville warbler	--	--	--	--	w
American redstart	w	--	--	--	w
Mourning warbler	--	w	--	--	--
Rose-breasted grosbeak	w	w	w	w	w
Indigo bunting	w	w	w	w	w
Chipping sparrow	w	w	w	w	w
Clay-colored sparrow	w	w	--	--	f
Song sparrow	w	w	--	w	w
White-throated sparrow	--	--	w	--	--
Vesper sparrow	f	f	f	f	--
Savannah sparrow	--	f	--	--	f
Bobolink	f	f	f	f	f
Brewer's blackbird	f	f	f	f	f
Brown-headed cowbird	f	--	--	--	f
Northern oriole	--	w	w	w	--
Lapland longspur	--	--	f	--	--
American goldfinch	w	w	w	w	w
Totals	23w,4f	23w,4f	20w,4f	25w,3f	23w,6f

As the plantation matured, to woodland species (red-eyed vireo and ovenbird) began breeding and were the most numerous species at the end of the study. In addition to changes in breeding bird usage of the plantation, similar changes were found in non-breeding birds. As the plantation matured, blue jays, cuckoos, and several warbler species were frequently observed.

The effects of adjacent vegetation on bird usage of the population need additional study, but several observations suggest some relationships. First, during all surveys from the third growing season on, birds frequently were observed flying between woods and plantations. Bird interaction between adjacent fields and *Populus* plantations was less common. Second, plantations may provide suitable habitat so that birds from adjacent wooded areas can move to specific age plantations. For example clay-colored sparrows and indigo buntings were present in adjacent woodlands before being found in relatively high densities in a 3-year-old study area. Finally, plantations may provide a habitat that will allow species not found on adjacent land to establish populations. For example, the common yellowthroat was not observed in any of the habitats until the third growing season when it was found in high numbers in the plantations.

Effects of plantations on bird populations in adjacent areas appeared to be minimal in this study but should be considered before plantations are established (Verch 1983). Numbers of species in adjacent woodlands ranged from 20 to 25, and numbers in adjacent fields ranged from 3 to 6 (table 3). Twenty-two woodland and three field species were found in the adjacent areas during 3 or more years of the 5-year study.

Based on results of this study, breeding bird usage of an intensively cultured *Populus* plantation follows a pattern expected in secondary succession for

northern Wisconsin. Questions remain about bird usage of intensively managed *Populus* plantations. Bird usage of plantations needs to be observed throughout the year to obtain information about seasonal use. Studies on larger plantations, on plantations not under irrigation, and on plantations established by different methods should be considered in the future.

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APPENDIX

Scientific Names of Birds Mentioned in This Report

Common name	Scientific name
Northern harrier	*Circus cyaneus*
Killdeer	*Charadrius vociferus*
Mourning dove	*Zenaida macroura*
Black-billed cuckoo	*Coccyzus erythropthalmus*
Yellow-billed cuckoo	*Coccyzus americanus*
Downy woodpecker	*Picoides pubescens*
Northern flicker	*Colaptes auratus*
Eastern peewee	*Contopus virens*
Eastern phoebe	*Sayornis phoebe*
Great crested flycatcher	*Myiarchus crinitus*
Eastern kingbird	*Tyrannus tyrannus*
Least flycatcher	*Empidonax minimus*
Horned lark	*Eremophila alpestris*
Tree swallow	*Tachycineta bicolor*
Cliff swallow	*Hirundo pyrrhonota*
Barn swallow	*Hirundo rustica*
Blue jay	*Cyanocitta cristata*
American crow	*Corvus brachyrhynchos*
Black-capped chickadee	*Parus atricapillus*
Eastern bluebird	*Sialia sialis*
Veery	*Catharus fuscescens*
American robin	*Turdus migratorius*
Gray catbird	*Dumetella carolinensis*
Brown thrasher	*Toxostoma rufum*
Warbling vireo	*Vireo gilvus*
Red-eyed vireo	*Vireo olivaceus*
Nashville warbler	*Vermivora ruficapilla*
Yellow warbler	*Dendroica petechia*
Chestnut-sided warbler	*Dendroica pensylvanica*
Black and white warbler	*Mniotilta varia*
American redstart	*Setophaga ruticilla*
Ovenbird	*Seiurus aurocapillus*
Mourning warbler	*Oporornis philadelphia*
Common yellowthroat	*Geothlypis trichas*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Indigo bunting	*Passerina cyanea*
Chipping sparrow	*Spizella passerina*
Clay-colored sparrow	*Spizella pallida*
Vesper sparrow	*Pooecetes gramineus*
Savannah sparrow	*Passerculus sandwichensis*
Song sparrow	*Melospiza melodia*
White-throated sparrow	*Zonotrichia albicollis*
Lapland longspur	*Calcarius lapponicus*
Bobolink	*Dolichonyx oryzivorus*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown-headed cowbird	*Molothrus ater*
Northern oriole	*Icterus galbula*
American goldfinch	*Carduelis tristis*

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